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WHAT IS CLAIMED IS:

1. An apparatus operable to facilitate add/drop multiplexing of optical signals, the apparatus comprising:

an input operable to receive an input optical signal and an added optical signal, and to generate a first and a second copy of the input signal and a first and a second copy of the added signal;

a plurality of at least substantially reflective surfaces, each operable to receive either the first signal copies or the second signal copies and to reflect the copies for ultimate combination at an output to form an output signal for transmission, at least one of the at least substantially reflective surfaces comprising a moveable mirror operable to change its position relative to the input to create a phase shift between the first and second signal copies so that either the input optical signal or the added optical signal is communicated as the output signal depending on the position of the at least one moveable mirror.

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2. The apparatus of Claim 1, wherein at least one of the at least substantially reflective surfaces comprises a micro-electro-optic system (MEMS) device operable to undergo a substantially piston-like motion to change its position relative to the input.

3. The apparatus of Claim 2, wherein the MEMS device comprises:

an inner conductive layer disposed inwardly from the moveable mirror layer and forming a space between the moveable mirror layer and the inner conductive layer;

wherein the moveable mirror layer comprises an at least substantially conductive layer operable to move relative to the inner conductive layer in response to a voltage difference between the moveable mirror layer and the inner conductive layer.

4. The apparatus of Claim 3, wherein the inner conductive layer comprises a doped semiconductor substrate.

5. The apparatus of Claim 3, wherein the inner conductive layer comprises a layer of at least substantially conductive material formed outwardly from a semiconductor substrate.

6. The apparatus of Claim 3, wherein the moveable mirror layer comprises a plurality of adjacent mirror strips, at least some of the plurality of adjacent mirror strips separated by air gaps operable to relieve air damping when the mirror strips move relative to the inner conductive layer.

7. The apparatus of Claim 6, wherein all of the moveable mirror strips move at least substantially in unison in response to the voltage difference.

8. The apparatus of Claim 7, wherein either the inner conductive layer or each of the moveable mirror strips is coupled to a ground, and wherein the other is operable to receive a control voltage signal.

9. The apparatus of Claim 3, wherein a grazing angle between the moveable mirror layer and the signal copy reflected by the moveable mirror layer comprises an angle that is less than forty-five degrees.

10. The apparatus of Claim 3, further comprising a second MEMS device disposed between the first MEMS device and the output, the second MEMS device comprising a moveable mirror layer operable to receive a phase shifted signal copy from the first MEMS device and to change its position relative to the first MEMS device to introduce a further phase shift to the signal copy.

11. The apparatus of Claim 1, wherein the input comprises a first beam splitter and wherein the output comprises a second beam splitter.

12. The apparatus of Claim 1, wherein the input and the output comprise a single beam splitting device.

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13. The apparatus of Claim 11, further comprising at least one additional reflective surface between the beam splitter and the first MEMS device, the at least one additional reflective surface operable to receive a signal copy from the first beam splitter and to reflect the signal copy for ultimate reception by the first mirror.

14. An apparatus operable to facilitate add/drop multiplexing of optical signals, the apparatus comprising:

a drop phase shift stage operable to receive an input optical signal and to either drop the input signal or to pass the optical signal toward an output, the drop phase shift stage comprising an at least substantially reflective surface operable to change its position to affect whether the input signal is dropped or passed to the output; and

an add phase shift stage operable to receive and communicate as an output either an added signal or the input signal passed from the drop phase shift stage, the add phase shift stage comprising an at least substantially reflective surface operable to change its position to affect whether the added signal or the input signal is passed to the output.

15. The apparatus of Claim 14, wherein at least one of the at least substantially reflective surfaces comprises a moveable mirror layer of a micro-electro-optic system (MEMS) device operable to undergo a substantially piston-like motion to change its position.

16. The apparatus of Claim 14, wherein the drop phase shift stage comprises:

a beam splitter operable to receive the input signal and communicate at least two copies of the signal in at least two directions; and

a plurality of at least substantially reflective surfaces, each operable to receive one of the signal copies and to reflect the copies for ultimate combination at an output to form an output signal;

wherein at least one of the at least substantially reflective surfaces comprises a moveable mirror layer of a first micro-electro-optic system (MEMS) device, the moveable mirror layer operable to experience a substantially piston-like motion to change its position relative to the beam splitter, the change in position causing a phase shift between the signal copies and a corresponding interference between the signal copies at the output, the input signal being either passed to the add phase shift stage or dropped, depending on the position of the moveable mirror.

17. The apparatus of Claim 14, wherein the add phase shift stage comprises:

a beam splitter operable to receive either the added input signal or the input signal passed from the drop phase shift stage, the beam splitter further operable to communicate at least two copies of the received signal in at least two directions; and

a plurality of at least substantially reflective surfaces, each operable to receive one of the signal copies and to reflect the copies for ultimate combination at an output to form an output signal;

wherein at least one of the at least substantially reflective surfaces comprises a moveable mirror layer of a first micro-electro-optic system (MEMS) device, the moveable mirror layer operable to experience a substantially piston-like motion to change its position relative to the beam splitter, the change in position causing a phase shift between the signal copies to result in the received signal being communicated through the output of the add phase shift stage.

18. The apparatus of Claim 14, wherein the at least substantially reflective surfaces of the add phase shift stage and the drop phase shift stages each comprise a first MEMS-based device having a moveable mirror layer operable to experience a substantially piston-like motion in response to a control signal.

19. The apparatus of Claim 18, wherein the first MEMS device comprises:

an inner conductive layer disposed inwardly from the moveable mirror layer and forming a space between the moveable mirror layer and the inner conductive layer;

wherein the moveable mirror layer comprises an at least substantially conductive layer operable to move relative to the inner conductive layer in response to a voltage difference between the moveable mirror layer and the inner conductive layer.

20. The apparatus of Claim 19, wherein the moveable mirror layer comprises a plurality of adjacent mirror strips, at least some of the plurality of adjacent mirror strips separated by air gaps operable to relieve air damping when the mirror strips move relative to the inner conductive layer.

21. The apparatus of Claim 20, wherein all of the moveable mirror strips move at least substantially in unison in response to the voltage difference.

22. A wave division add/drop multiplexer, comprising:

a wavelength division demultiplexer operable to separate an optical input signal into a plurality of wavelengths;

an array of optical add/drop multiplexers coupled to the demultiplexer, at least one of the add/drop mutiplexers comprising:

a drop phase shift stage operable to receive an input wavelength and to either drop the input wavelength or to pass the input wavelength toward an output, the drop phase shift stage comprising an at least substantially reflective surface operable to change its position to affect whether the input wavelength is dropped or passed to the output; and

an add phase shift stage operable to receive and communicate as an output either an added wavelength or the input wavelength passed from the drop phase shift stage, the add phase shift stage comprising an at least substantially reflective surface operable to change its position to affect whether the added wavelength or the input wavelength is passed to the output; and

a wavelength division multiplexer operable to receive a plurality of output wavelengths from the add phase shift stage and to multiplex at least some of the output wavelengths into an optical output signal.

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23. The wave division add/drop multiplexer of Claim 22, wherein at least one of the at least substantially reflective surfaces comprises a moveable mirror layer of a micro-electro-optic system (MEMS) device operable to undergo a substantially piston-like motion to change its position.

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24. The wave division add/drop multiplexer of Claim 22, further comprising a bypass path coupled between the wavelength division demultiplexer and the wavelength division multiplexer, the bypass path operable to communicate at least one wavelength directly between the demultiplexer and the multiplexer without processing the at least one wavelength.

25. A wave division add/drop multiplexer, comprising:

a wavelength division demultiplexer operable to separate an optical input signal into a plurality of wavelengths;

an array of optical add/drop multiplexers coupled to the demultiplexer, at least one of the add/drop mutiplexers comprising:

an input operable to receive an input wavelength signal and an added wavelength signal, and to generate a first and a second copy of the input signal and a first and a second copy of the added signal;

a plurality of at least substantially reflective surfaces, each operable to receive either the first signal copies or the second signal copies and to reflect the copies for ultimate combination at an output to form an output signal for transmission, at least one of the at least substantially reflective surfaces comprising a moveable mirror operable to change its position relative to the input to create a phase shift between the first and second signal copies so that either the input optical signal or the added optical signal is communicated as the output signal depending on the position of the at least one moveable mirror; and

a wavelength division multiplexer operable to receive a plurality of output signals from the array of add/drop multiplexers and to multiplex at least some of the output wavelengths into an optical output signal.

26. A wave division add/drop multiplexer, comprising:

a wavelength division demultiplexer operable to separate an optical input signal into a plurality of wavelengths;

an array of optical add/drop multiplexers coupled to the demultiplexer, at least one of the add/drop mutiplexers comprising a micro-electro-optic system (MEMS) device comprising a moveable mirror layer operable to undergo a substantially piston-like motion to create a phase difference between a wavelength reflected from the moveable mirror layer and a substantial copy of that wavelength, the position of the moveable mirror layer affecting whether the input wavelength is passed through or dropped from the array; and

a wavelength division multiplexer operable to receive a plurality of output wavelengths from the array and to multiplex at least some of the output wavelengths into an optical output signal.

27. A method of facilitating optical add/drop multiplexing, comprising:

receiving an input optical signal and an added optical signal;

generating a first and a second copy of the input signal;

generating a first and a second copy of the added signal;

communicating the first signal copies toward a first mirror and the second signal copies toward the second mirror;

changing the position of the first mirror to create a phase shift between the first and second copy when combined at an output; and

communicating either an added signal or the input signal as an output signal depending at least in part on the position of the first mirror.

28. The method of Claim 27, wherein the first mirror comprises a micro-electro-optic system (MEMS) device having a moveable mirror layer operable to experience a substantially piston-like motion in response to a control signal.

29. The method of Claim 28, wherein the MEMS device comprises an inner conductive layer disposed inwardly from the moveable mirror layer and forming a space between the moveable mirror layer and the inner conductive layer; and

wherein changing the position of the moveable mirror layer comprises displacing the moveable mirror layer relative to the inner conductive layer in response to a voltage difference between the moveable mirror layer and the inner conductive layer.

30. The method of Claim 29, wherein the moveable mirror layer comprises a plurality of adjacent mirror strips, at least some of the plurality of adjacent mirror strips separated by air gaps operable to relieve air damping when the mirror strips move relative to the inner conductive layer.

31. The method of Claim 30, wherein changing the position of the moveable mirror layer comprises displacing all of the moveable mirror strips relative to the inner conductive layer substantially in unison in response to the voltage difference.

32. The method of Claim 30, wherein changing the position of the moveable mirror layer comprises:

coupling either the inner conductive layer or each of the moveable mirror strips to a ground; and

applying to the other a control voltage signal.

33. The method of Claim 29, wherein changing the position of the moveable mirror layer comprises selectively displacing the moveable mirror layer relative to the inner conductive layer, wherein the distance increases as the voltage difference between the moveable mirror layer and the inner conductive layer increases.

34. A method of facilitating optical add/drop multiplexing, comprising:

receiving an optical input signal at a first stage;

generating a first and a second copy of the input signal;

communicating the first signal copy toward a first mirror and the second signal copy toward the second mirror;

communicating either an added signal or the input signal from the first stage toward a second stage depending at least in part on the position of the first mirror;

generating a first and a second copy of the signal received at the second stage;

communicating the first received signal copy toward a third mirror and the second received signal copy toward a fourth mirror; and

communicating either the added signal or the input signal from the first stage from the second output depending at least in part on the position of the third mirror.

35. The method of Claim 34, wherein the first mirror comprises a micro-electro-optic system (MEMS) device having a moveable mirror layer operable to experience a substantially piston-like motion in response to a control signal.

36. The method of Claim 35, wherein the MEMS device comprises an inner conductive layer disposed inwardly from the moveable mirror layer and forming a space between the moveable mirror layer and the inner conductive layer; and

wherein changing the position of the moveable mirror layer comprises displacing the moveable mirror layer relative to the inner conductive layer in response to a voltage difference between the moveable mirror layer and the inner conductive layer.

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37. The method of Claim 36, wherein the moveable mirror layer comprises a plurality of adjacent mirror strips, at least some of the plurality of adjacent mirror strips separated by air gaps operable to relieve air damping when the mirror strips move relative to the inner conductive layer.

38. The method of Claim 37, wherein changing the position of the moveable mirror layer comprises displacing all of the moveable mirror strips relative to the inner conductive layer substantially in unison in response to the voltage difference.

39. A method of facilitating wave division add/drop multiplexing, comprising:

receiving an optical input signal comprising a plurality of wavelengths;

separating the optical signal into a plurality of wavelength signals;

communicating at least some of the wavelength signals to an array of optical add/drop multiplexers;

at at least one of the add/drop multiplexers:

receiving an input optical signal and an added optical signal;

generating a first and a second copy of the input signal;

generating a first and a second copy of the added signal;

communicating the first signal copies toward a first mirror and the second signal copies toward the second mirror;

changing the position of the first mirror to create a phase shift between the first and second copy when combined at an output; and

communicating either an added signal or the input signal as an output signal depending at least in part on the position of the first mirror.

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40. A method of facilitating wave division add/drop multiplexing, comprising:

receiving an optical input signal comprising a plurality of wavelengths;

separating the optical signal into a plurality of wavelength signals;

communicating at least some of the wavelength signals to an array of optical add/drop multiplexers;

at at least one of the add/drop multiplexers:

receiving an optical input signal at a first stage;

generating a first and a second copy of the input signal;

communicating the first signal copy toward a first mirror and the second signal copy toward the second mirror;

changing the position of the first mirror to create a phase shift between the first and second copy when combined at an output of the first stage;

communicating either an added signal or the input signal from the first stage toward a second stage depending at least in part on the position of the first mirror;

generating a first and a second copy of the signal received at the second stage;

communicating the first received signal copy toward a third mirror and the second received signal copy toward a fourth mirror;

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changing the position of the third mirror to create a phase shift between the first and second received signal copies when combined at the second output; and

communicating either the added signal or the input signal from the first stage from the second output depending at least in part on the position of the third mirror.

41. An apparatus operable to facilitate add/drop multiplexing of optical signals, the apparatus comprising:

an input operable to receive an input optical signal and an added optical signal, and to generate a first and a second copy of the input signal and a first and a second copy of the added signal;

a plurality of at least substantially reflective surfaces, each operable to receive either the first signal copies or the second signal copies and to reflect the copies for ultimate combination at an output to form an output signal for transmission, at least one of the at least substantially reflective surfaces comprising a Micro-electro-optic system (MEMS) device comprising a plurality of adjacent mirror strips, the mirror strips operable to change their position substantially in unison in a substantially piston-like motion relative to the input to create a phase shift between the first and second signal copies so that either the input optical signal or the added optical signal is communicated as the output signal depending on the position of the at least one moveable mirror.

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42. A method of facilitating optical add/drop multiplexing, comprising:

receiving an input optical signal and an added optical signal;

generating a first and a second copy of the input signal;

generating a first and a second copy of the added signal;

communicating the first signal copies toward a first mirror and the second signal copies toward the second mirror, the first mirror comprising a plurality of adjacent mirror strips operable to receive the first signal;

displacing adjacent mirror strips substantially in unison in a substantially piston-like motion to create a phase shift between the first and second copy when combined at an output; and

communicating either an added signal or the input signal as an output signal depending at least in part on the position of the adjacent mirror strips.